AMENDMENTS TO THE SPECIFICATION

On page 7, please amend the top paragraph, lines 1-7, as follows:

G1

--bandgap ramp will not be applicable in cases where diamond is ~~chosed~~ chosen as the semiconductor. The external applied electric field set up to penetrate the target can achieve a similar result. The field penetration is applicable with all semiconductors and will exhibit various degrees of effectiveness depending on doping concentrations and other well-known characteristics of the semiconductor chosen.--

On page 14, please amend the bottom paragraph, lines 24-33, as follows:

G2

--We now refer to Fig. 2, which better illustrates the details of target **46** and the necessary conditions for bombardment by seed electrons **18** of beam **16** to obtain high brightness and low energy spread beam **64**. The distance between illumination surface **44** and emission surface ~~48~~56 defines a target thickness t. Since electrode **40** is transparent to seed electrons **18** and no appreciable generation of electron-hole pairs occurs in electrode **40**, thickness t does not take into account electrode **40**. For example, electrode **40** is a thin Al coating or gold layer which is crack free.--

On page 15, please amend the bottom paragraph, lines 27-34, as follows:

G3

--A fraction of electron-hole pairs **72** supply emission electrons **12** at emission surface ~~48~~56. In particular, as shown in the energy diagram on the example of one electron **68**, thickness t of target **46** is selected in coordination with the energy of seed electrons **18** and taking into account the electron-hole recombination rate. Specifically, target thickness t is selected such that by the time electron **68**

a3 reaches emission surface ~~48~~56 it is substantially thermalized but has still not

On page 16, please amend the entire page, lines 1-34, as follows:

had sufficient time to recombine with hole **70**. In other words, by the time electron **68** reaches emission surface ~~48~~56 it is contained in the lowermost (hatched) portion of conduction band **74** but has not had sufficient time to drop back into valence band **76** due to electron-hole recombination. a4 Thermalization is a process by which the energy of electron **68** is reduced through phonon interactions and other interactions with the lattice of semiconductor **52**. At room-temperature substantially thermalized electron **68** exhibit an energy spread of about 0.026 eV and even less at lower temperatures. There are other contributions to this energy spread, however, depending on specific conditions as is known in the art. Reported energy spreads are as low as .5 eV but less than .1 eV can also be achieved. For the purposes of this application substantially thermalized electron **68** exhibits ~~and~~ an energy spread of about 1 eV or less and preferably about 0.1 eV or even less.

A certain fraction of electrons **68** from electron-hole pairs **72** become thermalized, as described above, and are drawn off emission surface ~~48~~56 by electric field E_2. Because of NEA of semiconductor **52** at emission surface **56** thanks to hydrogen-termination or Cs and O coating **54**, energy bands **74** and **76** are bent near emission surface such that the lowermost portion of conduction band **74** drops below the vacuum energy level (not shown). In other words, there is no energy barrier at emission surface **56** to the emission of emission electrons **12**. This

condition enables electric field E_2 to easily draw off emission electrons **12** from emission surface **~~48~~56**. Because emission electrons **12** are drawn from the available pool of substantially thermalized electrons **68**, they exhibit an energy spread which is usually degraded by the Boerch effect. This effect causes the electron energy spread to become somewhat worse in beam **64**. A person skilled in the art will know that—

G4

On page 17, please amend the entire page, lines 1-34, as follows:

~~-t~~this effect can be mitigated if emission electrons **12** are accelerated very quickly by external applied electric field E_2.

Emission electrons **12** drawn off emission surface **~~48~~56** produce beam **64** exhibiting a high brightness or current per unit solid angle. Referring back to Fig. 1, emission electrons **12** are drawn off and exhibit a solid angle schematically indicated by a in Fig. 1. The angular distribution is typically Lambertian, or cos α. The emission electrons **12** exhibit a brightness at 10 keV applied field E_2 of better than 10^5 A/cm^2/sterdian. In conjunction with the robustness of target **46** and an energy spread of less than 1 eV and preferably less than .1 eV this renders semiconductor source **10** an excellent electron beam source for high resolution SEM, display applications, as well as lithography, low-noise amplification, metrological applications and many others. Source **10** is easy to use, efficient and low-cost and robust.

G5

In optimizing the energy of seed electrons **18** and thickness t of target **46**, it is useful to determine the penetration depth of seed electrons **18** inside target **46**. The energy of seed electrons **18** is then preferably selected such that seed electrons **18** do not fully penetrate target **46**. At the same

G5

time, the energy spread of emission electrons **12** can be monitored as a function of thickness t (e.g., by using a wedge-shaped target **46**). Fig. 3 illustrates a typical energy spread decrease as thickness t is increased. The dashed graph indicates the energy of emission electrons **12** observed at a first thickness t_1 and the solid graph indicates the energy of emission electrons **12** at a larger thickness t_2. Both thicknesses t_1, t_2 are selected to completely prevent the penetration of target **~~44~~46** by seed electrons **18**. Clearly, at thickness t_2 the energy spread B is smaller than the energy spread A at thickness t_1. Therefore, thickness t_2 is selected.